

# Digital Transformation of Complex Multi-tiered Supply Networks

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**SAFETY** first.



**QUALITY** always.



**VALUES** every day.

# Forward-looking Statement

Certain statements in this presentation relate to future events and expectations and are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Words such as “believe,” “estimate,” “will be,” “will,” “would,” “expect,” “anticipate,” “plan,” “project,” “intend,” “could,” “should” or other similar words or expressions often identify forward-looking statements. All statements other than statements of historical fact are forward-looking statements, including, without limitation, statements regarding our outlook, projections, forecasts or trend descriptions. These statements do not guarantee future performance and speak only as of the date they are made, and we do not undertake to update our forward-looking statements. Caterpillar’s actual results may differ materially from those described or implied in our forward-looking statements based on a number of factors, including, but not limited to: (i) global and regional economic conditions and economic conditions in the industries we serve; (ii) commodity price changes, material price increases, fluctuations in demand for our products or significant shortages of material; (iii) government monetary or fiscal policies; (iv) political and economic risks, commercial instability and events beyond our control in the countries in which we operate; (v) our ability to develop, produce and market quality products that meet our customers’ needs; (vi) the impact of the highly competitive environment in which we operate on our sales and pricing; (vii) information technology security threats and computer crime; (viii) additional restructuring costs or a failure to realize anticipated savings or benefits from past or future cost reduction actions; (ix) failure to realize all of the anticipated benefits from initiatives to increase our productivity, efficiency and cash flow and to reduce costs; (x) inventory management decisions and sourcing practices of our dealers and our OEM customers; (xi) a failure to realize, or a delay in realizing, all of the anticipated benefits of our acquisitions, joint ventures or divestitures; (xii) union disputes or other employee relations issues; (xiii) adverse effects of unexpected events including natural disasters; (xiv) disruptions or volatility in global financial markets limiting our sources of liquidity or the liquidity of our customers, dealers and suppliers; (xv) failure to maintain our credit ratings and potential resulting increases to our cost of borrowing and adverse effects on our cost of funds, liquidity, competitive position and access to capital markets; (xvi) our Financial Products segment’s risks associated with the financial services industry; (xvii) changes in interest rates or market liquidity conditions; (xviii) an increase in delinquencies, repossessions or net losses of Cat Financial’s customers; (xix) currency fluctuations; (xx) our or Cat Financial’s compliance with financial and other restrictive covenants in debt agreements; (xxi) increased pension plan funding obligations; (xxii) alleged or actual violations of trade or anti-corruption laws and regulations; (xxiii) international trade policies and their impact on demand for our products and our competitive position; (xxiv) additional tax expense or exposure; (xxv) significant legal proceedings, claims, lawsuits or government investigations; (xxvi) new regulations or changes in financial services regulations; (xxvii) compliance with environmental laws and regulations; and (xxviii) other factors described in more detail in Caterpillar’s Forms 10-Q, 10-K and other filings with the Securities and Exchange Commission.

# Strategy for Profitable Growth



## Services

Growing digital-enabled solutions and aftermarket offerings to deliver unmatched value to customers.



## Operational Excellence

Building upon core competencies – safety, quality, Lean and cost discipline – to deliver strong operational performance.



## Expanded Offerings

Enabling customer success through integrated and differentiated solutions.

# Agenda

- Manufacturing and Supply Network Landscape
- Engineered Value Chain
- Transformational Approach
- Agile Deployment Methodology
- IOT Sensors, Visualization and Process Automation
- Summary - Conclusions

# Manufacturing Landscape

## North America

Joliet CAO (IL)  
East Peoria KK (IL)  
Sumter (SC)  
Cienega de Flores, Monterrey (MX)  
Santa Caterina, Monterrey (MX)

## Europe

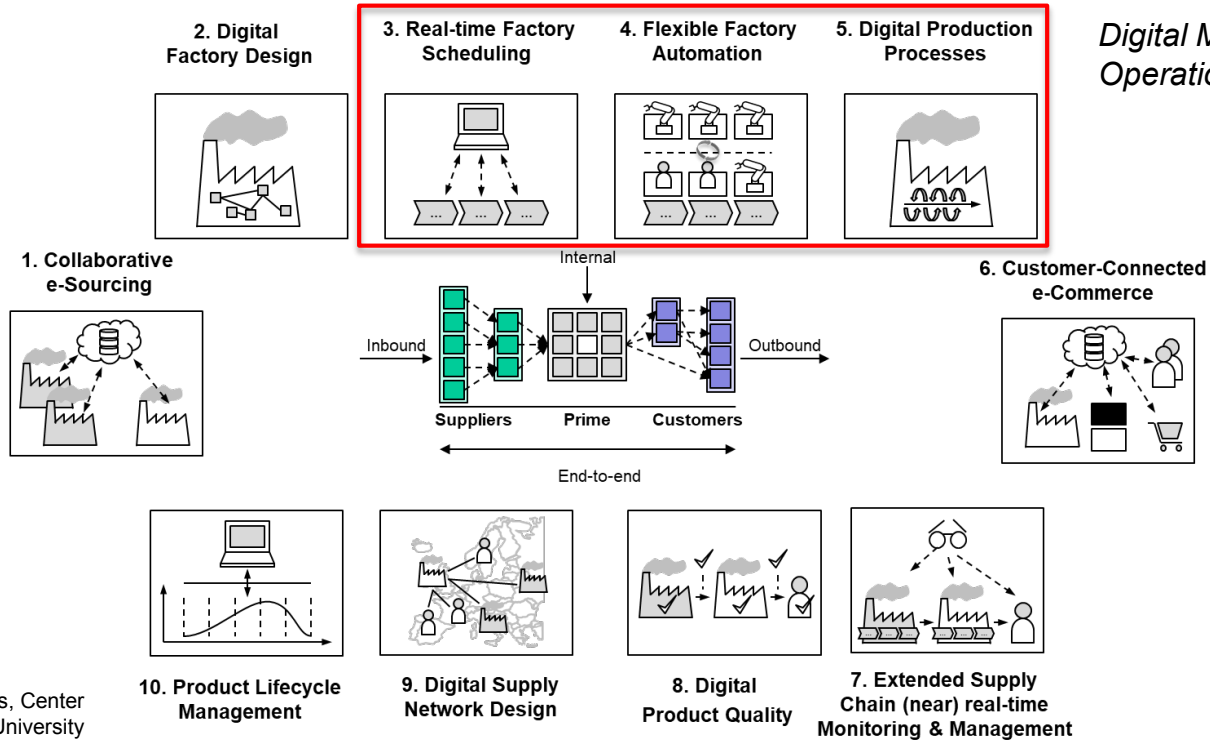
Springvale N.I. (UK)  
Jesi (I)

## S.E Asia

Wuxi (CH)

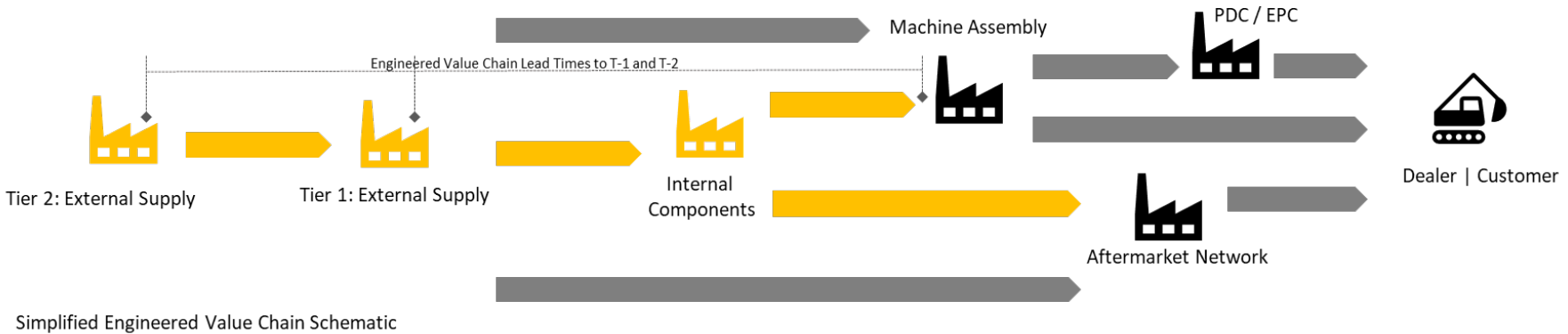


# Supply Network Landscape



Source: Digital Supply Chain Scenarios, Center for International Manufacturing | IfM | University of Cambridge 2019

# The Engineered Value Chain

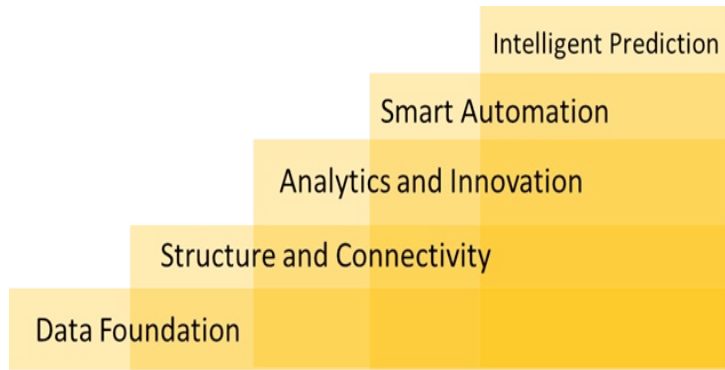


- Dynamic, complex, multi-tier system intended to create flow from order to delivery
- Inventory is strategically used to modulate flow, ensure demand variation and lead-time requirements are compatible with the required output

VUCA | Volatile, Uncertain,  
Complex, Ambiguous



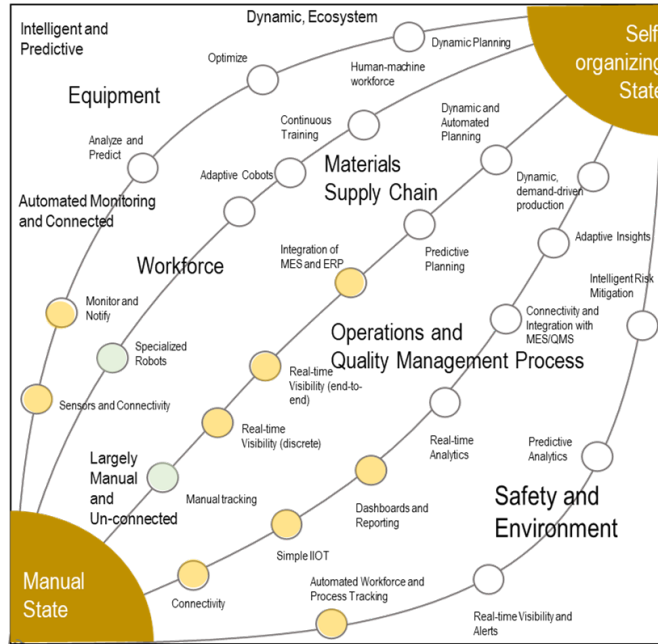
# Transformation Approach



**Transformational Steps**

*“Research shows that 84% of business leaders expect the industrial IOT to disrupt their operating models. Only 7% have a comprehensive strategy.”*

*Schaeffer, Industry X.0*

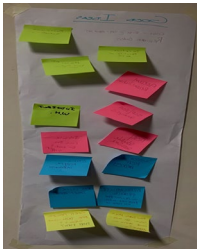


**Transformation Roadmap:** Adapted for ACM from: Schaeffer D., Industry X.0, Realizing Digital Value in Industrial Sectors, 2017

# Agile Deployment Methodology

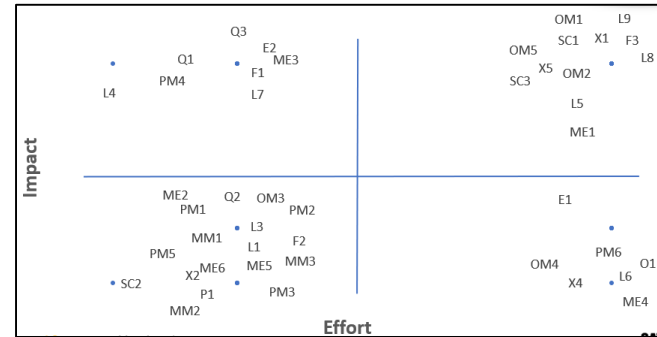


- Cross-functional interviews
- Generate Ideas



- Review data, data structures
- Physical and transactional processes
- Initial analysis and validation

- Consolidate
- Consensus, leadership buy-in and change management
- Generate prioritized plan

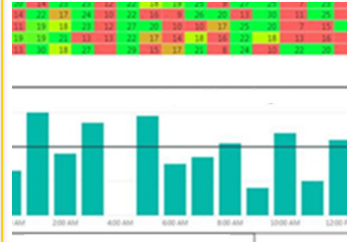


# IOT Sensors, Visualization and Process Automation

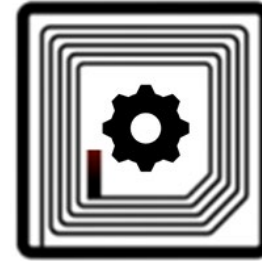
RPA



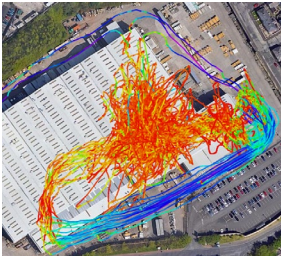
Dashboards



Tracking



IOT Sensors



ML Cameras



On-demand Robots



# Robotic Process Automation

**Description:** Program that emulates human-system interfaces and performs repetitive tasks



## Productivity boost

- Increased throughput
- 24/7 activity
- Quickly scalable
- Allows focus on value add activities



## Quality & service

- Accurate processing & reduced errors
- Faster processing
- Improved transparency and data quality



## Improved decisions

- Improved data quality and reporting
- Enables enhanced decision making for management



## Risk Reduction

- Embedded controls
- Run pre-defined processes with complete audit trail
- User permissions allow segregation of duties

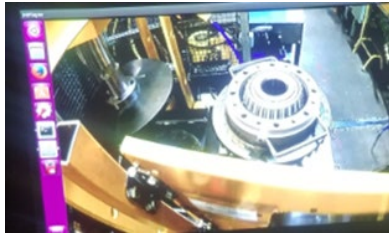


## Employee Satisfaction

- Eliminate performance of high volume repetitive tasks
- Enables focus on value-add activities

# Cobots and Cameras

Use of machine learning vision systems applied to quality and safety-related opportunities



*In less than 1y have come a long way from being able to detect puppies and muffins*



## Anticipated Benefits

- Error-proofing and automation of PDI processes
- Reduction/redeployment of manual resources
- Significantly improved ergonomics
- Enhancement of process/quality control gates; elimination of passing quality defects to customers
- Improved Safety/Risk



Example: Automation of PDI

# Summary - Conclusions

- Data, Data Structure and Connectivity are foundational
- Process is engaging
- Opportunities for RPA's, IOT Devices, ML Systems
- Ability to rapidly scale and alignment to long-term vision important

**Thank you | Questions?**